U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
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CRUISE REPORT[1]

VESSEL: NOAA Ship *Oscar Elton Sette*, Cruise SE-12-06

PROJECT PERIOD: August 12 – 25, 2012

AREA OF OPERATION: Main Hawaiian Islands (MHI), specifically offshore leeward waters of Niihau, Oahu, Lanai, and the Kona Coast of the Island of Hawaii (see Fig. 1).

TYPE OF OPERATION: The NOAA Ship *Oscar Elton Sette* was engaged in support for the Fisheries Research and Monitoring Division (FRMD) Life History Program (LHP), and the Ecosystems and Oceanography Division (EOD) of the Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS) fisheries research programs. The primary missions involved the collection of pelagic stage juvenile eteline snappers via midwater Cobb trawl hauls and the collection of larval billfish via 1.8-m surface Isaacs-Kidd (IK) tows. Oceanographic data was collected via conductivity-time-depth (CTD) casts in order to describe the physical, chemical, and biological environments associated with the leeward MHI and specifically in association with the midwater Cobb trawl hauls.

ITINERARY:

12 August — Embarked scientific personnel: Chief Scientist Robert Humphreys; PIFSC scientists Louise Giuseffi; JIMAR/UH scientists Johanna Wren; University of Washington student Zack Oyafuso; and Monterey Bay Aquarium staff aquarists Wyatt Patry and Heather White. Departed Pearl Harbor,

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Issued 7 January 2013

	Oahu at 1430; arrived at first operational station 25-nm offshore leeward Oahu and commenced first midwater Cobb trawl haul.
13 August	Second Cobb trawl at 25-nm offshore leeward Oahu station was cancelled due to a radio request from the Coast Guard to respond to a distress call from a sailboat in the vicinity. The distress call response was subsequently cancelled and the *Sette* returned to the 25-nm offshore leeward Oahu station to conduct a 1000-m depth CTD cast. Afterwards the ship transited to the 50-nm offshore leeward Oahu station.
13-14 August	Arrived at 50-nm offshore leeward Oahu station and commenced a 1000-m depth CTD cast followed by two midwater Cobb trawl hauls starting at 1830 and 0130 hours. A 1-h surface IK tow was conducted after sunrise and afterwards the ship transited to the 75-nm offshore leeward Oahu station.
14-15 August	Arrived at 75-nm offshore leeward Oahu station and commenced a 1000-m depth CTD cast followed by two midwater Cobb trawl hauls starting at 1830 and 0130 hours. Afterwards the ship transited to the 25-nm offshore leeward Niihau station.
15-16 August	Arrived at 25-nm offshore leeward Niihau station and commenced a 1000-m depth CTD cast followed by two midwater Cobb trawl hauls starting at 1830 and 0130 hours. A 1-h surface IK tow was conducted after sunrise and afterwards the ship transited to the 50-nm offshore leeward Niihau station.
16-17 August	Arrived at 50-nm offshore leeward Niihau station and commenced a 1000-m depth CTD cast followed by two midwater Cobb trawl hauls starting at 1830 and 0130 hours. A 1-h surface IK tow was conducted after sunrise and afterwards the ship transited to the 75-nm offshore leeward Niihau station.
17-18 August	Arrived at 75-nm offshore leeward Niihau station and commenced a 1000-m depth CTD cast followed by two midwater Cobb trawl hauls starting at 1830 and 0130 hours. Afterwards the ship transited to the 75-nm offshore leeward Kona Coast Hawaii Island station.

18-19 August	Midway during transit to 75-nm offshore leeward Kona Coast Hawaii Island station at 83 nm offshore of southwest leeward Oahu commenced a 1000-m depth CTD cast followed by one midwater Cobb trawl haul starting at 1830 hours. Afterwards the ship resumed transit to the 75-nm offshore leeward Kona Coast Hawaii Island station.
19-20 August	Arrived at 75-nm offshore leeward Kona Coast Hawaii Island station and commenced a 1000-m depth CTD cast followed by two midwater Cobb trawl hauls starting at 1830 and 0130 hours. A 1-h surface IK tow was conducted after sunrise and afterwards the ship transited to the 50-nm offshore leeward Kona Coast Hawaii Island station.
20-21 August	Arrived at 50-nm offshore leeward Kona Coast Hawaii Island station and commenced a 1000-m depth CTD cast followed by two midwater Cobb trawl hauls starting at 1830 and 0130 hours. Afterwards the ship transited to the 25-nm offshore leeward Kona Coast Hawaii Island station.
21-22 August	Arrived at 25-nm offshore leeward Kona Coast Hawaii Island station and commenced a 1000-m depth CTD cast followed by two midwater Cobb trawl hauls starting at 1830 and 0130 hours. Afterwards the ship transited to the 25-nm offshore leeward Lanai station.
22-23 August	Arrived at 25-nm offshore leeward Lanai station and commenced a 1000-m depth CTD cast followed by two midwater Cobb trawl hauls starting at 1830 and 0130 hours. Afterwards the ship transited to the 75-nm offshore leeward Lanai station.
23-24 August	Arrived at 75-nm offshore leeward Lanai station and commenced a 1000-m depth CTD cast followed by two midwater Cobb trawl hauls starting at 1830 and 0130 hours. Afterwards the ship transited to the 50-nm offshore leeward Lanai station.
24-25 August	Arrived at 50-nm offshore leeward Lanai station and commenced a 1000-m depth CTD cast followed by two midwater Cobb trawl hauls starting at 1830 and 0130 hours. Afterwards the ship transited to the dock at Ford Island.
25 August	Arrived and docked at Ford Island at 1100h to end cruise. Disembarked scientific staff Giuseffi, Humphreys, Oyafuso, Patry, White, and Wren.

MISSIONS AND RESULTS:

A. Conduct nighttime stern midwater Cobb trawl operations at selected stations using a three-stepped oblique pattern of retrieval to sample target depths of 170-175 m, 100-125 m and 20-25 m. These trawl collections were conducted to obtain specimens of juvenile pelagic stages of commercially important eteline and *Lutjanus* snapper species.

1. Twenty-four night midwater Cobb trawls were conducted and successfully completed during this cruise. Two trawl hauls per station (beginning at 1830h and 0130h) were conducted at locations 25, 50, and 75-nm off the leeward coasts of Oahu, Niihau, the Kona Coast of Hawaii Island, and Lanai with the exception of only one Cobb trawl haul conducted off the 25-nm leeward Oahu station and only one Cobb trawl haul at the mid-transit station 83-nm southwest of Oahu (see Table 1 and Fig. 1). Based on previous catch information from SE-11-06, trawl hauls were conducted to target depths between 20 to 175 m depth. This was performed by targeting three depth strata (170-175 m, 100-120 m and 20-25 m) for one hour during each Cobb trawl haul. Upon retrieval of the codend for each trawl, the entire catch was placed in a large metal bucket, the water strained from the catch, and the entire catch weighed. The catch was then brought into the Wet Lab, sorted into groupings composed of gelatinous zooplankton, miscellaneous zooplankton, crustaceans, cephalopods, mesopelagic fish, and shore fish, and weighed separately. The shore fish category was composed exclusively of pelagic stage individuals of reef fish, bottomfish, and epipelagic fish species including leptocephali larvae. All shore fish specimens sorted from the trawl were retained and preserved in 95% undenatured ethanol. Most cephalopods were composed of various squid species which were saved frozen. The remainder of the catch (primarily mesopelagic fishes, crustaceans, and zooplankton) was discarded.

2. The shore fish component of the Cobb trawl catches was of primary importance during sorting of the catch. Care was needed in separating and recognizing the pelagic stages of etelines from closely resembling apogonids; the etelines distinguishable by having one rather than two dorsal fins. At-sea sorting of the Cobb trawl catch after each haul yielded a total of 93 eteline and 106 *Lutjanus* spp. pelagic stage individuals. These specimens were present in 20 of the 24 Cobb trawl hauls conducted during this cruise. Sixteen pelagic stage etelines and 32 *Lutjanus* spp. were captured off the leeward Niihau trawl stations, 9 etelines and 10 *Lutjanus* spp. were captured off the leeward Oahu stations, 6 etelines and 3 *Lutjanus* spp. were captured off the leeward Lanai stations, 47 etelines and 40 *Lutjanus* spp. were captured off the leeward Hawaii Island stations, and 15 etelines and 21 *Lutjanus* spp. captured at the station 83-nm southwest of Oahu. In terms of offshore distribution, overall catches of

pelagic stage etelines and Lutjanus spp. specimens were similar among the three offshore distances: 33 etelines and 39 *Lutjanus* spp. caught ≥75-nm offshore, 31 etelines and 38 *Lutjanus* spp. caught 50-nm offshore, and 28 etelines and 29 *Lutjanus* spp. caught 25-nm offshore. These results indicate that pelagic stages of etelines and *Lutjanus* spp. are distributed offshore to at least 75-nm of the leeward sides of the main Hawaiian Islands and that the full extent of this offshore dispersal will require additional sampling well beyond 75-nm offshore. Species identifications of pelagic stage lutjanids collected during this cruise await confirmation via mtDNA sequencing.

3. Among the five classification groupings that Cobb trawl animals were sorted into, mesopelagic fish and cephalopods (squid) predominated by weight in all Cobb trawl hauls, typically accounting for a combined ≥50% of the catch. Crustaceans and shore fish were typically the smallest components of the catch by weight. Total catch per Cobb trawl haul were greater at stations conducted off the leeward sides of Niihau and the Kona Coast of Hawaii Island.

4. Catches of live cookie-cutter sharks (*Isistius brasiliensis*) have been collected in Cobb trawl hauls during previous cruises working offshore of the Kona Coast. During this cruise, aquarist Wyatt Paty and Heather White of the Monterey Bay Aquarium brought onboard a large captivity tank and oxygen aeration systems to attempt maintaining live specimens for transfer back to the aquarium. A total of 2 cookie cutter sharks and one specimen of the pygmy shark (*Euprotomicrus bispinatus*) were captured. One specimen caught late in the cruise survived to be transported back to the Monterey Bay Aquarium but succumbed shortly thereafter.

5. The NetMinde acoustic system used to track the depth of the Cobb trawl involves the placement of two sensor units onto the nets headrope and when operating properly provides real-time data on net depth and water temperature during trawl operations. Previous to the cruise, the NetMinde depth sensor had been sent back to the manufacturer for re-calibration. At the beginning of the cruise, the NetMinde depth sensor provided erroneous depth data; typically indicating the net at much shallower depths than realized when the net is being towed at the deepest of the three depths (170-175 m). Concurrent depth readings provided by time-depth-recorders (TDRs) placed alongside the NetMinde depth sensor on the headrope confirmed these discrepancies. To rectify this problem, the *Sette*'s Survey Technician (Robert Spina) re-calibrated the NetMinde depth sensor by placing this sensor unit on the CTD and casting it to depths corresponding to the three targeted trawl depths. Based on the known depths relayed from the lowered CTD, the NetMinde depth sensor algorithms were successfully adjusted (beginning at the 75-nm offshore

Kona Coast station) to conform to depth readings provided by the CTD sensor. This resulted in depth sensor readings within 5-m of the actual depth. This adjustment and re-calibration of the NetMinde depth sensor was considered successful particularly in comparison with the TDRs which typically vary no more than 2m from the CTD depth readings.

B. The ship collected oceanographic data from conductivity-temperature-depth (CTD) casts at predetermined locations while continuous data measurements collected underway was gathered by the acoustic Doppler current profiler (ADCP) and thermosalinograph (TSG) instruments. The CTD casts were also used to perform CTD-mounted fluorometer measurements and laboratory determination of nutrients, chlorophyll and accessory pigment determinations from Niskin water bottle samples collected during CTD casts. These data will be used to assess the physical environment and biological productivity associated with the midwater Cobb trawl sites.

The following report on the oceanographic results and findings from this cruise were written and provided herein by participating scientist Zack Oyafuso:

1. A total of 13 CTD casts were performed during the cruise (see Table 2) to obtain vertical profile data to ascertain the physical characteristics and oceanography associated with the early-life pelagic stage of eteline and *Lutjanus* species. Each CTD cast was deployed to 1000-m depth and conducted in association and prior to each nightly pair of midwater Cobb trawl hauls during the cruise. During each CTD cast, Niskin bottles were deployed to collect water samples at depths of 0 m, 20 m, 35 m, 50 m, 65 m, 80 m, 100 m, 125 m, 150 m, and 200 m. These water samples were filtered, stored in 90% acetone in a freezer for 24−48 hours, and then measured for fluorescence with a Turner Designs 10AU™ Field and Laboratory Fluorometer to isolate for chlorophyll-*a*. Oxygen sensors were also attached to the CTD rosette to measure oxygen concentration.

2. The stations sampled on the leeward waters of the main Hawaiian Islands (MHI) were characterized generally by a shallow mixed layer (ML) 25−50 m in depth. Surface waters were around 26°C (Fig. 1b) with the 25°C isotherm at approximately 50 m. Salinity values generally ranged from 34.6 to 35.6 psu (Fig. 1f) and chlorophyll-*a* values generally ranged from 0 to 0.5 µg/L (Fig. 1d). Deep Chlorophyll Maximum (DCM) values showed interisland and intra-island differences, but were generally from 75−125 m (Fig. 1d). A Subsurface Oxygen Maximum (SOM) around 75 m (Fig. 1c) just above the DCM was apparent in most of the stations (Fig. 2). A band of higher oxygen saturation followed the shallowest 4.6 mL/L isopleth of oxygen concentration (Figs. 3a and 3b) and was blocked by the 23.5 kg/m^3 isopycnal (Fig. 3c). Seldom did the oxygen saturation exceed

100%, which would indicate an excess in biological oxygen production; however, there was a distinct subsurface bump of oxygen concentration and saturation. The data also indicated that the highest magnitude of the SOM occurred at higher latitudes where the change in sea surface temperature (SST) was the greatest.

3. Leeward Oahu Oceanography: The 25-nm and 50-nm offshore sites had MLs 50 m deep while the 75-nm leeward ML was shallower, around 25 m (Fig. 4a). The 75-nm offshore DCM was higher in magnitude, but shallower than the 50-nm and 25-nm offshore DCM (Fig. 4b). Shoaling of the isopycnals (Fig. 5b) offshore were concomitant with a tongue of higher salinity water moving inshore (Fig. 5a) to a depth of 100 m. The source of this movement could be tidal, as the time of the CTD occurred just after high tide (NOAA), however it is unknown how far offshore tides become a factor on the region's oceanography.

4. Leeward Niihau Oceanography: The ML deepened, from 20 m to 50 m to 70 m for the 25-nm, 50-nm, and 75-nm offshore MLs, respectively (Fig. 6a). The DCM was closer in depth, around 115 m, with the 75-nm offshore maximum the highest in magnitude (Fig. 6b). There was a slight dome 80 km wide in the isopycnals at depth (Fig. 7c) and also with the 25°C isotherm (Fig. 7b). The altimetry data for the region showed a slight depression in SSH (Fig. 8), which may account for the slight elevation in the isopycnals. A band of higher salinity water bound by the 35.6 psu isohaline started at 75-nm offshore and moved toward the 25-nm offshore site (inshore) along the 23.5 kg/m^3 isopycnal (Fig. 7a). The sampling took place just after high tide (NOAA), and could explain the salinity band at 50 m, yet the effect of tides over 100 km from shore is unknown.

5. Leeward Kona Coast of Hawaii Island: The 75-nm and 50-nm offshore MLs were closer in depth, around 45 m, with the 25-nm offshore ML shallower, around 35 m (Fig. 9a). The 25-nm and 50-nm offshore DCM were closer in magnitude, approximately 0.35 μg/L, with the 75-nm and 50-nm offshore maxima closer in depth, around 110 m (Fig. 9b). The salinity profiles for the 50-nm and 75-nm offshore profiles were more similar to each other, staying constant for the first 50 m of the water column, then increasing slightly peaking at 100 m, and then decreasing to 200 m (Fig. 9c). The 25-nm offshore salinity profile showed a slight decrease in salinity to 200 m. There was a shoaling of all the transects shore-bound above 100 m; the shoaling of the sigma-t (Fig. 10c) and temperature (Fig. 10b) isopleths were only slight, while the salinity (Fig. 10a) and oxygen concentration (Fig. 10d) isopleths showed a distinct shoaling.

6. Leeward Lanai Oceanography: The ML depths of the Lanai stations were closer in depth, around 45 m for the 75-nm and 50-nm offshore stations,

and 35 m for the 25-nm offshore station (Fig. 11a). The DCM was all around 100 m, with the 25-nm offshore station near-shore maximum being the highest, and the 75-nm and 50-nm offshore DCM closer in magnitude (Fig. 11b). There was a shoaling of the 23.25 kg/m^3 isopycnal towards shore (Fig. 12a) above 50 m, contrasted with deeper isohalines shoaling offshore 100−150 m (Fig. 12b). There was pool of higher salinity water at the surface for the 50-nm and 75-nm offshore stations; however the pool of saltier water was at depth 125−150 m for the 25-nm offshore station.

7. Surface salinity values were more distinct in the 50-nm and 75-nm offshore stations, with the Niihau stations the highest and the Big Island Station being the lowest in magnitude. The range of surface densities also slightly widened for the 75-nm offshore profiles compared to the 25-nm and 50-nm offshore station profiles (Fig. 14). There were no trends for the ML depths between distances; however, the MLs for the 50-nm offshore stations were the closest in depth. The depths of the DCM were closer in value for the 75-nm stations (Fig. 15) while the 50-nm and 25-nm offshore DCM showed more variation in depth. There were no observable trends in fluorescence magnitudes; however, the 50-nm offshore DCM was the closest in magnitude, approximately 0.35 mg/L. Surface temperature did not show quite a change of surface temperature values for the four islands over the different distance stations (Fig. 16); thus the variations in surface density probably stemmed from the variation in surface salinities.

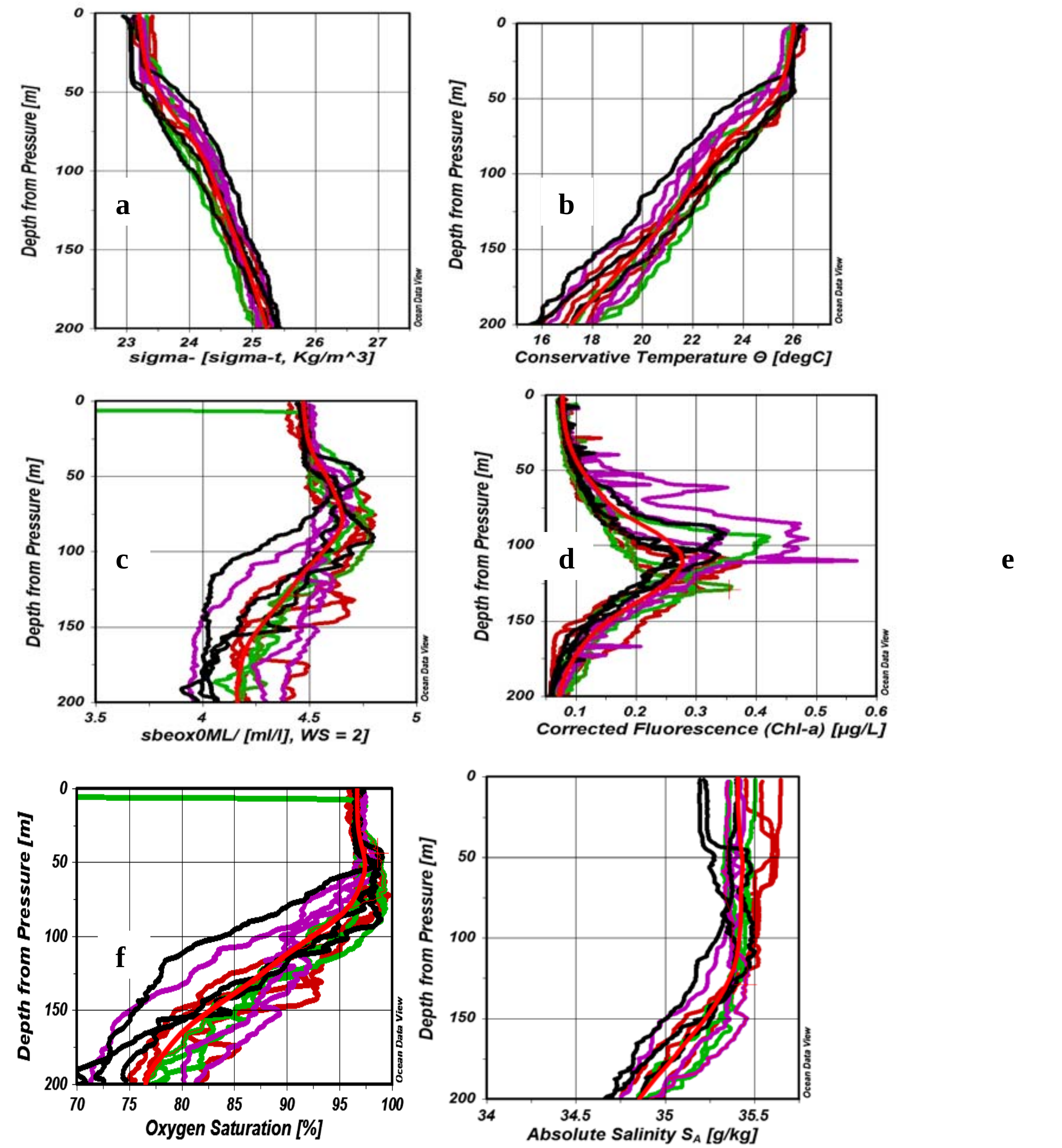

Figure 1: (a) Sigma-t, (b) conservative temperature, (c) [O2], (d) chlorophyll-*a* profiles, (e) O2 saturation, and (f) absolute salinity for all 13 stations. The bold red line shows the running average of all 13 stations. Red: Niihau stations; Green: Oahu stations; Purple: Lanai stations; Black; Big Island stations.

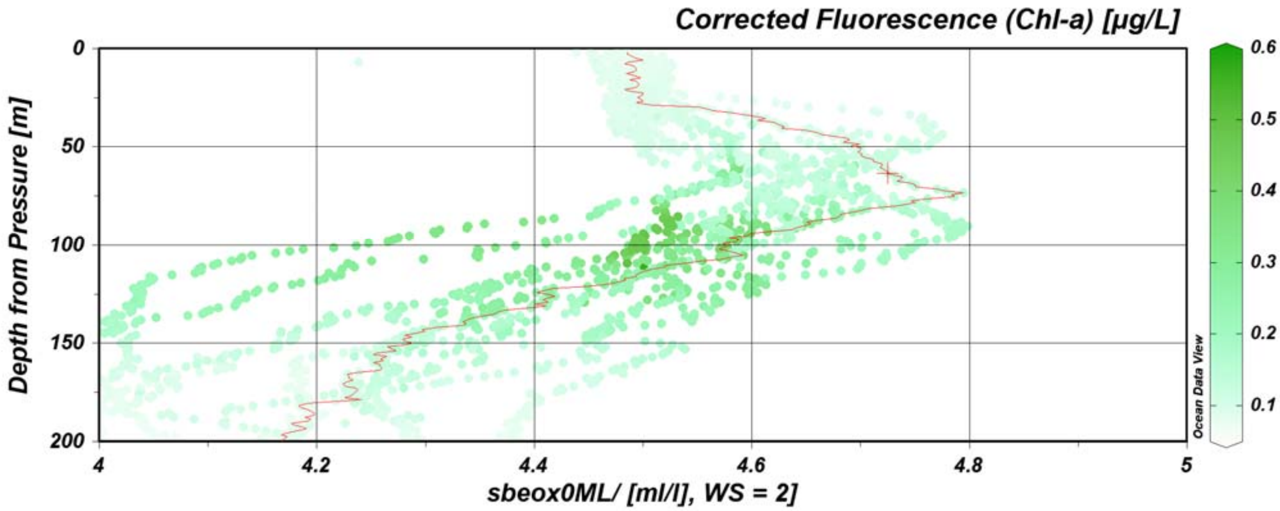

Figure 2: Chlorophyll-*a* concentration and [O2] as a function of depth for all 13 stations.

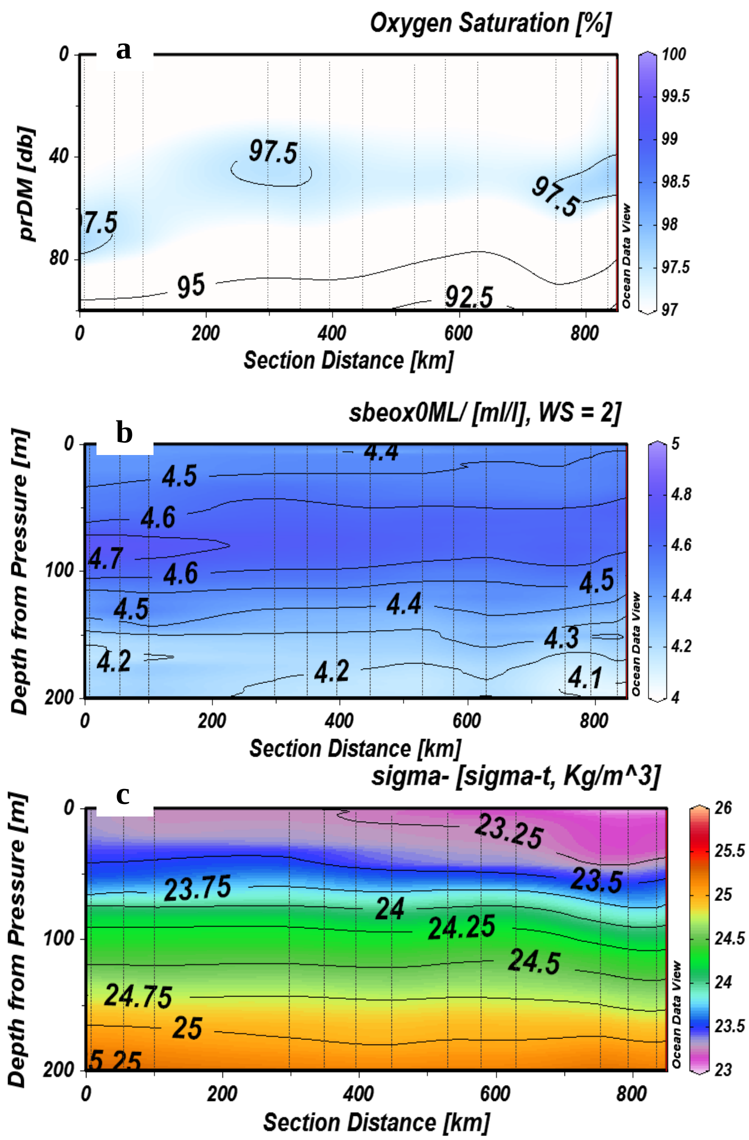

Figure 3: (a) Oxygen saturation, (b) [O2], and (c) sigma-t transects for all stations.

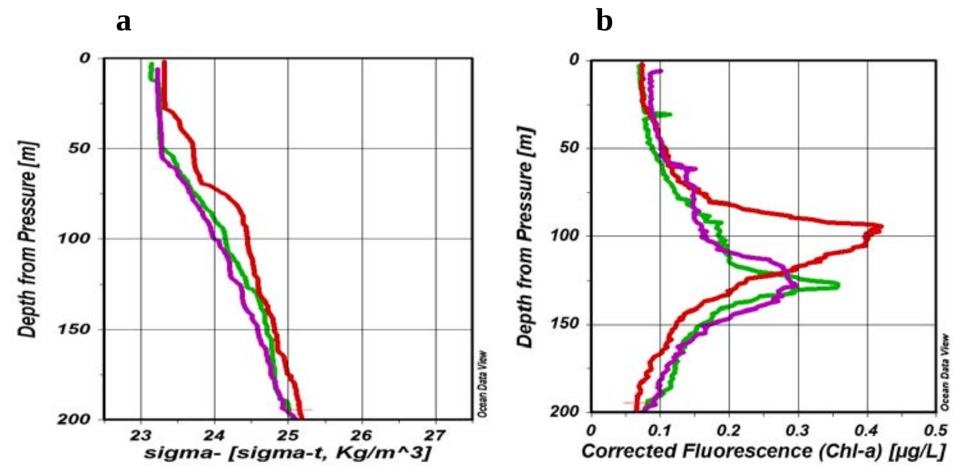

Figure 4: (a) Sigma-t, and (b) chlorophyll-a profiles for Oahu stations. Red: offshore; Green: mid-shore; Purple: near-shore.

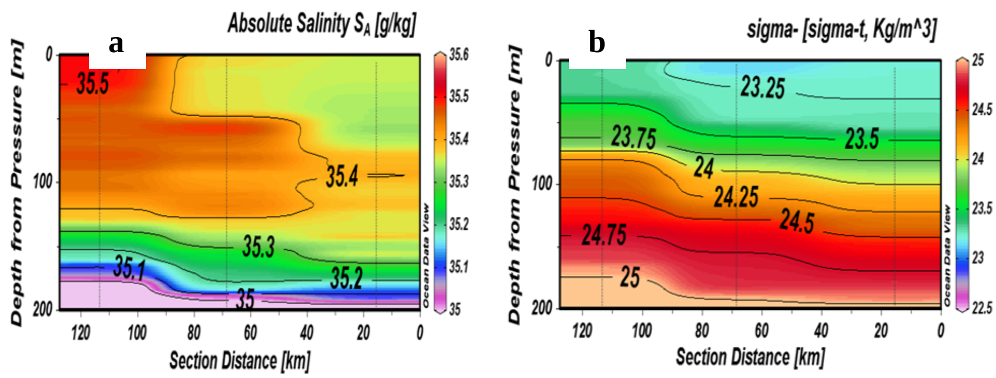

Figure 5: (a) Salinity and (b) sigma-t transects for Oahu stations.

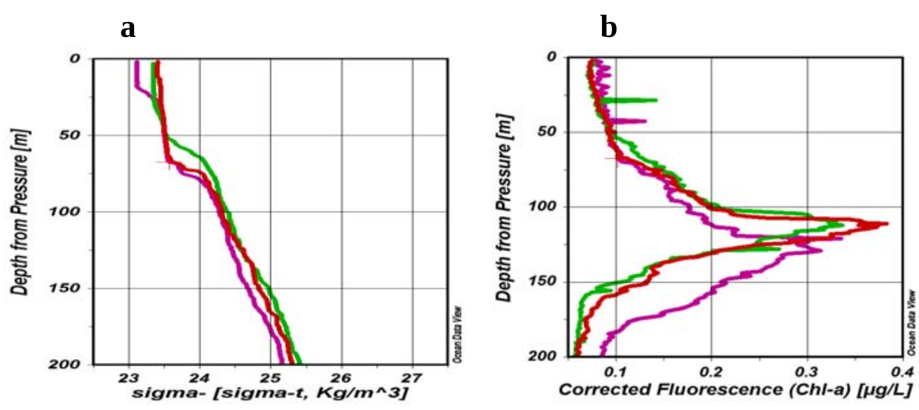

Figure 6: (a) Sigma-t and (b) chlorophyll-a profiles for Niihau stations. Red: offshore; Green: mid-shore; Purple: near-shore.

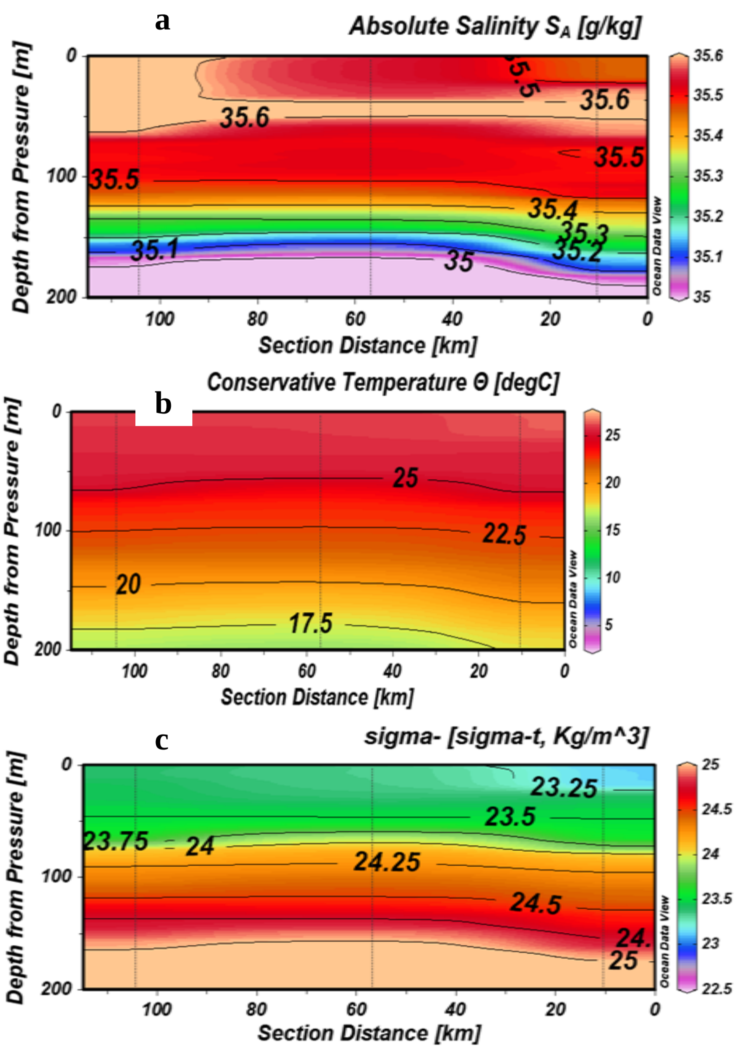

Figure 7: (a) Salinity, (b) temperature, and (c) sigma-t transects for Niihau stations.

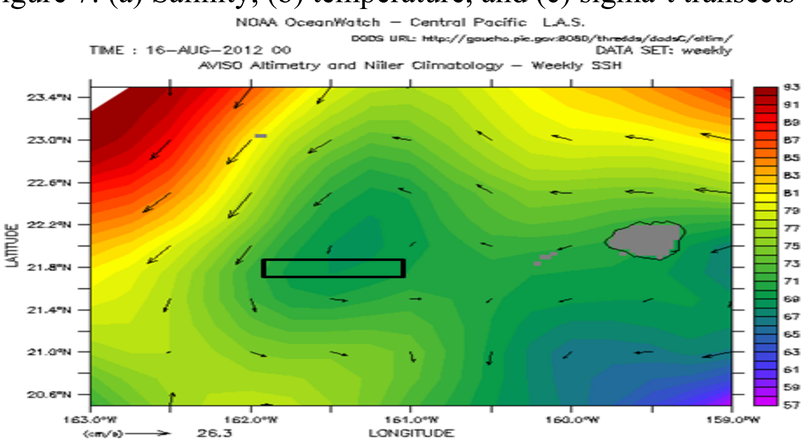

Figure 8: SSH with geostrophic currents for Niihau stations. Black box represents the area of CTD sampling.

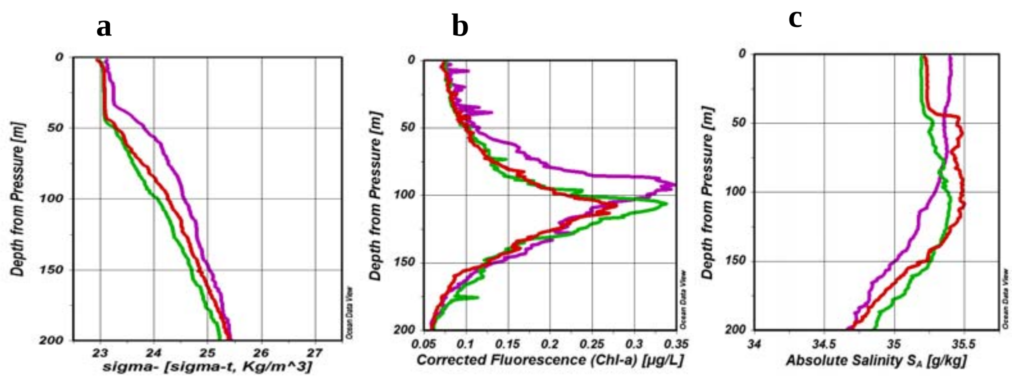

Figure 9: (a) Sigma-t, (b) chlorophyll-a, and (c) salinity profiles for Big Island stations. Red: offshore; Green: mid-shore; Purple: near-shore.

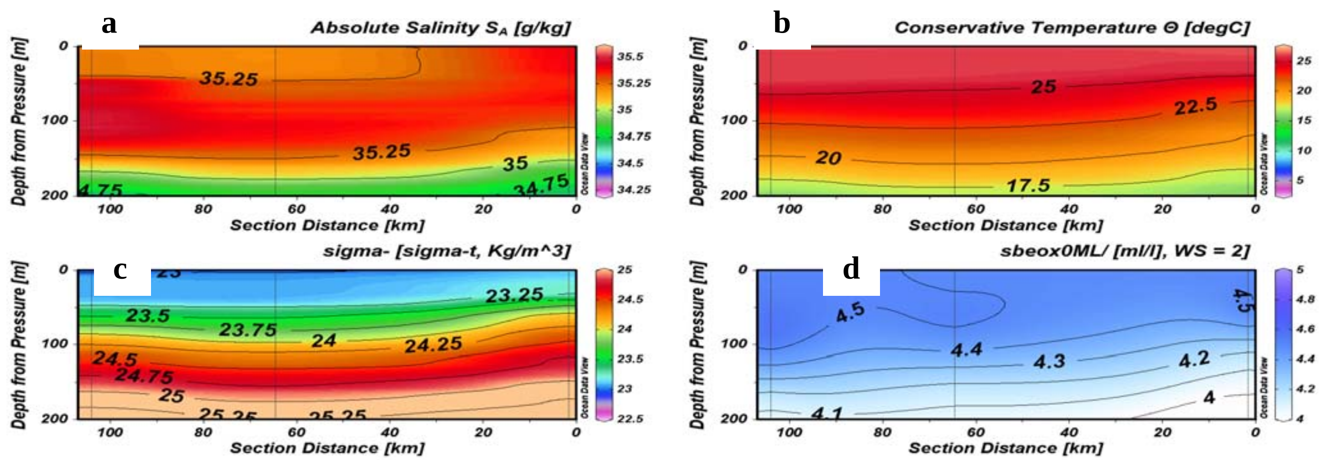

Figure 10: (a) Salinity, (b) temperature, (c) sigma-t, and (d) [O2] transects for Big Island stations.

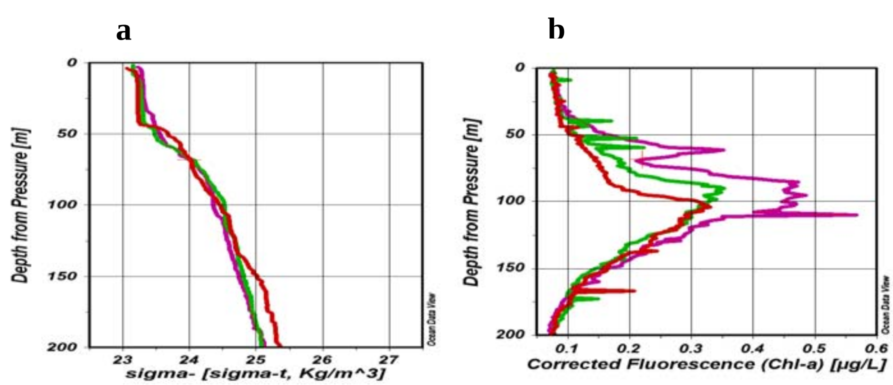

Figure 11: (a) Sigma-t and (b) chlorophyll-a profiles for Lanai stations. Red: offshore; Green: mid-shore; Purple: near-shore.

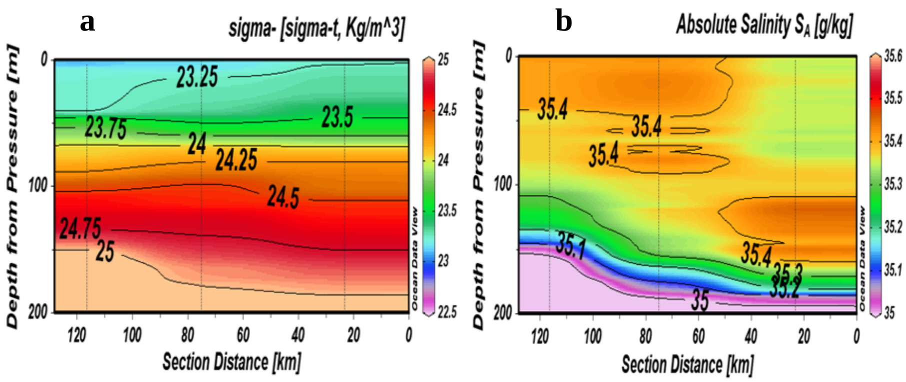

Figure 12: (a) Sigma-t and (b) salinity transects for Lanai stations.

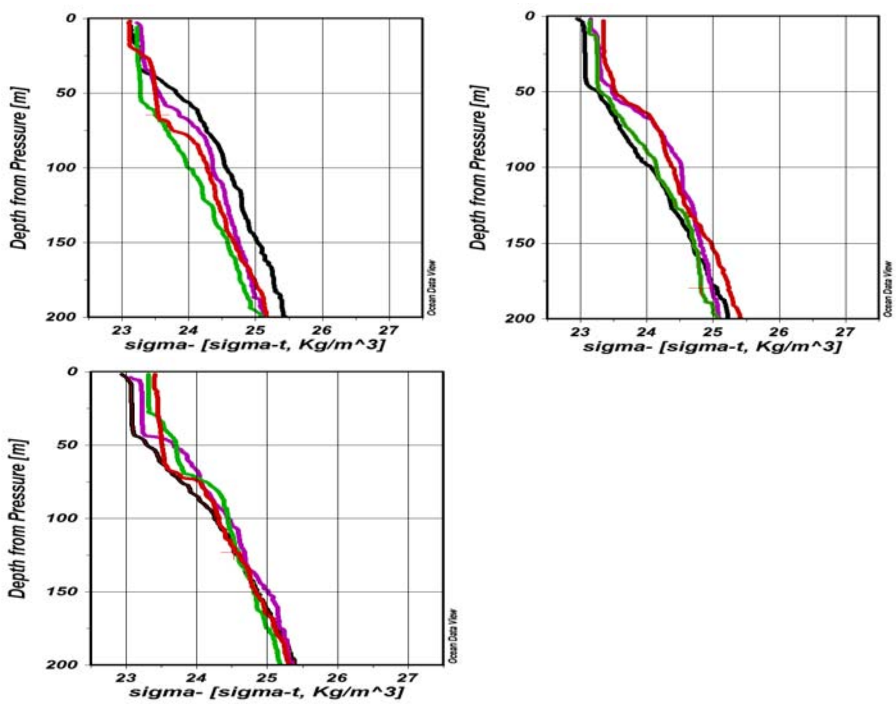

Figure 13: Sigma-t profiles for the 25 nm, 50 nm, and 75 nm stations, respectively. Red: Niihau stations; Green: Oahu stations; Purple: Lanai stations; Black; Big Island stations.

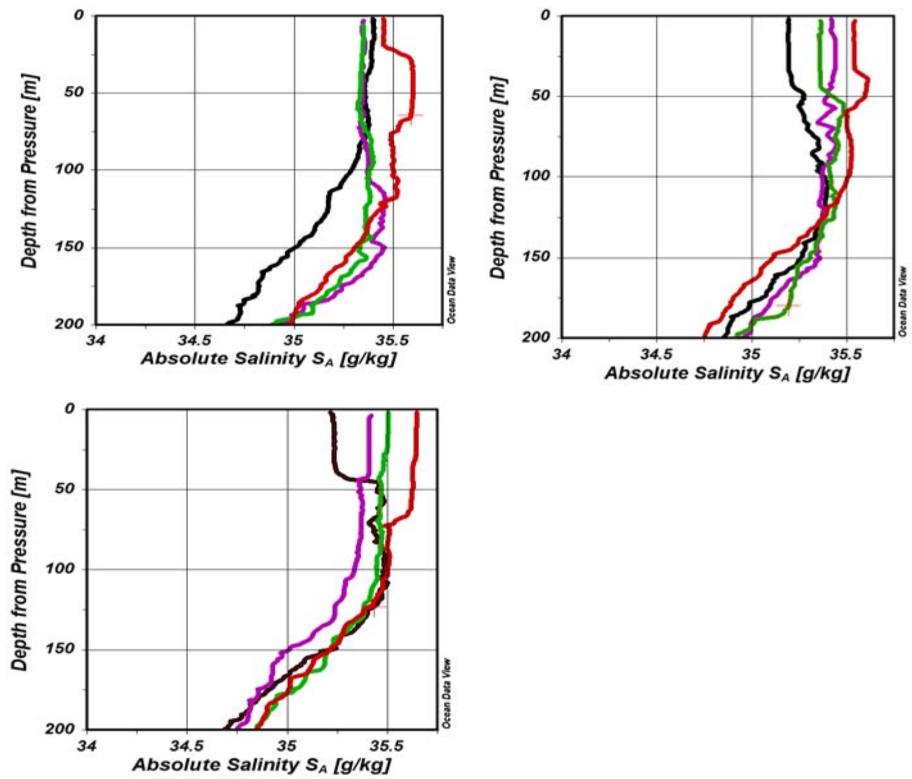

Figure 14: Salinity profiles for the 25 nm, 50 nm, and 75 nm stations, respectively. Red: Niihau stations; Green: Oahu stations; Purple: Lanai stations; Black; Big Island stations.

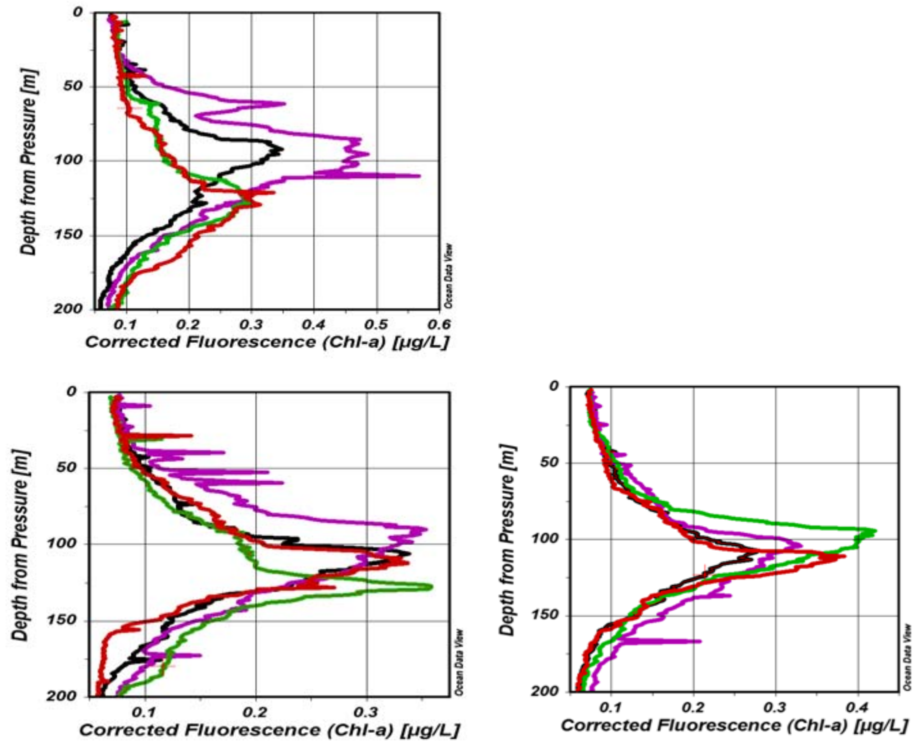

Figure 15: Chlorophyll-a profiles for the 25 nm, 50 nm, and 75 nm stations, respectively. Red: Niihau stations; Green: Oahu stations; Purple: Lanai stations; Black; Big Island stations.

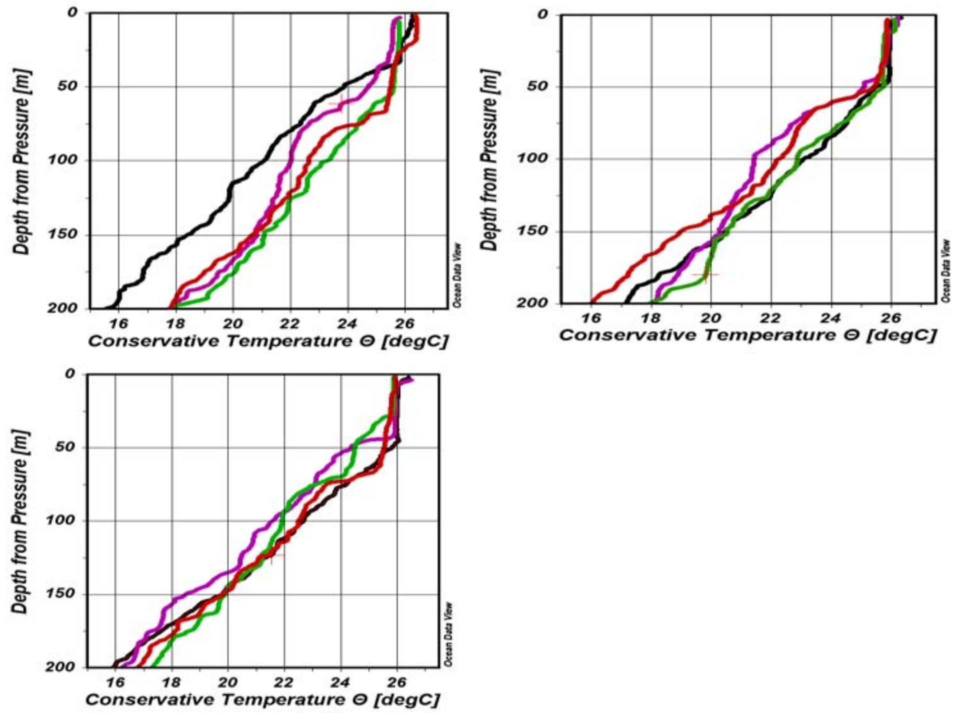

Figure 16: Temperature profiles for the 25 nm, 50 nm, and 75 nm stations, respectively. Red: Niihau stations; Green: Oahu stations; Purple: Lanai stations; Black; Big Island stations.

C. Conduct opportunistic daytime surface Issacs-Kidd plankton net tows targeting billfish larvae in offshore MHI leeward surface waters.

1. A total of four 1.8-m Isaacs-Kidd (IK) plankton tows were conducted during daylight morning hours. The IK net dimensions consisted of a net mouth width of 1.8 m and total length of 10 m. From the mouth opening to 8 m back consisted of 5 mm webbing while the posterior 2 m of net consisted of 0.5 mm Nytex netting. All tows were approximately 1-h duration and were operated from the mid-ship port side J-frame. The four IK tows were all conducted during the time interval 0700-0830h; one tow each was conducted at the following locations: 50-nm offshore leeward Oahu, 25-nm & 50-nm offshore leeward Niihau, and 75-nm offshore leeward Kona Coast of Hawaii Island (see Table 3). No catches of billfish larvae were obtained and few if any fish larvae were collected from these tows.

D. Conduct drifting night light operations for Monterey Bay Aquarium collections.

1. Night light operations were not feasible during this cruise due to winds and current experienced in offshore waters. One drifting night light operation (station 33) was conducted on August 21–22 in-between Cobb trawl hauls. Myctophids and pelagic stage pomacentrids were the primarily fish dip-netted at the surface around the submerged light.

SCIENTIFIC PERSONNEL:

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Louise Giuseffi, Biological Technician, PIFSC, NMFS
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Wyatt Patry, Cooperating Scientist, Monterey Bay Aquarium (MBA)
Heather White, Cooperating Scientist (MBA)
Johanna Wren, Cooperating Scientist, University of Hawaii Manoa

Submitted by: Robert L. Humphreys, Jr.

Robert L. Humphreys, Jr.
Chief Scientist

Approved by: S G Pooley

Samuel G. Pooley
Science Director
Pacific Islands Fisheries Science Center

Table 1. —Midwater Cobb trawl stations conducted on *Oscar Elton Sette* Cruise SE-12-06. Positions are in degrees and decimal min. Tow time at each of three depth ranges was 60 min after net depth equilibration.

Station No.	Date August 2012	Start Position Latitude ºN	Start Position Longitude ºW	Target depth ranges (m)	Headrope TDR depth ranges (m)	Wire out (m)	Start & End Local Time (trawl doors in-out)
1	12-13	21° 22.737	158° 38.577	170-175, 100-125, 20-25	230-268, 138-148, 29-30	650, 350, 100	2019-0004
4	13	21° 21.899	159° 07.162	170-175, 100-125, 20-25	166-210, 119-138, 32-45	525, 300, 100	1902-2244
5	14	21° 22.602	159° 08.933	170-175, 100-125, 20-25	170-190, 106-115, 29-34	525, 300, 100	0142-0516
8	14	21° 21.271	159° 34.306	170-175, 100-125, 20-25	151-172, 78-94, 17-21	500, 300, 100	1908-2250
9	15	21° 22.721	159° 32.713	170-175, 100-125, 20-25	146-171, 88-99, 23-30	500, 300, 100	0154-0536
12	15	21° 49.941	160° 44.214	170-175, 100-125, 20-25	154-190, 108-120, 28-38	500, 300, 100	1908-2249
13	16	21° 48.943	160° 45.791	170-175, 100-125, 20-25	153-192, 107-113, 32-42	500, 300, 100	0149-0524
16	16	21° 49.487	161° 11.469	170-175, 100-125, 20-25	181-213, 108-130, 24-35	500, 300, 100	1846-2222
17	17	21° 49.620	161° 13.223	170-175, 100-125, 20-25	152-199, 107-112, 26-31	500, 300, 100	0143-0516
20	17	21° 49.828	161° 39.910	170-175, 100-125, 20-25	166-193, 108-120, 29-33	500, 300, 100	1853-2231
21	18	21° 49.646	161° 39.540	170-175, 100-125, 20-25	148-178, 100-109, 25-29	500, 300, 100	0143-0519
23	18	20° 58.360	159° 46.038	170-175, 100-125, 20-25	160-202, 113-127, 28-35	500, 300, 100	1848-2221
25	19	19° 37.850	157° 18.418	170-175, 100-125, 20-25	142-177, 98-108, 28-37	500, 300, 100	1908-2244
26	20	19° 35.685	157° 21.616	170-175, 100-125, 20-25	148-190, 106-132, 32-44	500, 300, 100	0149-0524
29	20	19° 36.080	156° 53.735	170-175, 100-125, 20-25	156-168, 92-103, 24-27	500, 300, 100	1904-2241
30	21	19° 35.609	156° 54.511	170-175, 100-125, 20-25	166-195, 107-135, 31-40	500, 300, 100	0139-0516
32	21	19° 39.412	156° 25.398	170-175, 100-125, 20-25	151-184, 94-104, 22-27	500, 300, 100	1902-2240
34	22	19° 40.367	156° 23.950	170-175, 100-125, 20-25	144-172, 85-97, 22-26	500, 300, 100	0145-0519
36	22	20° 43.909	157° 27.753	170-175, 100-125, 20-25	152-176, 96-104, 24-28	500, 300, 100	1907-2245
37	23	20° 43.992	157° 28.980	170-175, 100-125, 20-25	162-199, 97-111, 22-28	500, 300, 100	0140-0516
39	23	20° 44.635	158° 20.493	170-175, 100-125, 20-25	154-172, 94-104, 23-25	500, 300, 100	1845-2221
40	24	20° 44.546	158° 21.190	170-175, 100-125, 20-25	134-167, 90-99, 22-24	500, 300, 100	0143-0516

Station No.	Date August 2012	Start Position Latitude ºN	Start Position Longitude ºW	Target depth ranges (m)	Headrope TDR depth ranges (m)	Wire out (m)	Start & End Local Time (trawl doors in-out)
42	24	20° 48.229	157° 55.800	170-175, 100-125, 20-25	145-172, 88-102, 21-23	500, 300, 100	1856-2230
43	25	20° 48.4	157° 55.7	170-175, 100-125, 20-25	132-158, 80-89, 18-21	500, 300, 100	0015-0346

Table 2. —Conductivity-Temperature-Depth (CTD) stations conducted on *Oscar Elton Sette* Cruise SE-12-06. Positions are in degrees and decimal min.

Cast No.	Station No.	Date August 2012	Start Position Latitude ºN	Start Position Longitude ºW	Target Depth Range of Cast (m)	Niskin Water Bottle Sampling Depths (m)
1	2	13	21° 24.218	158° 36.804	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
2	3	13	21° 21.032	159° 07.291	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
3	7	14	21° 21.551	159° 33.944	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
4	11	15	21° 49.130	160° 45.757	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
5	15	16	21° 48.292	161° 12.339	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
6	19	17	21° 48.837	161° 40.205	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
7	22	18	20° 56.918	159° 45.895	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
8	24	19	19° 38.287	157° 17.560	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
9	28	20	19° 34.794	156° 55.766	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
10	31	21	19° 40.800	156° 25.438	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
11	35	22	20° 44.621	157° 27.160	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
12	38	23	20° 43.703	158° 20.654	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0
13	41	24	20° 48.737	157° 56.571	0-1,000	200, 150, 125, 100, 80, 65, 50, 35, 20, 0

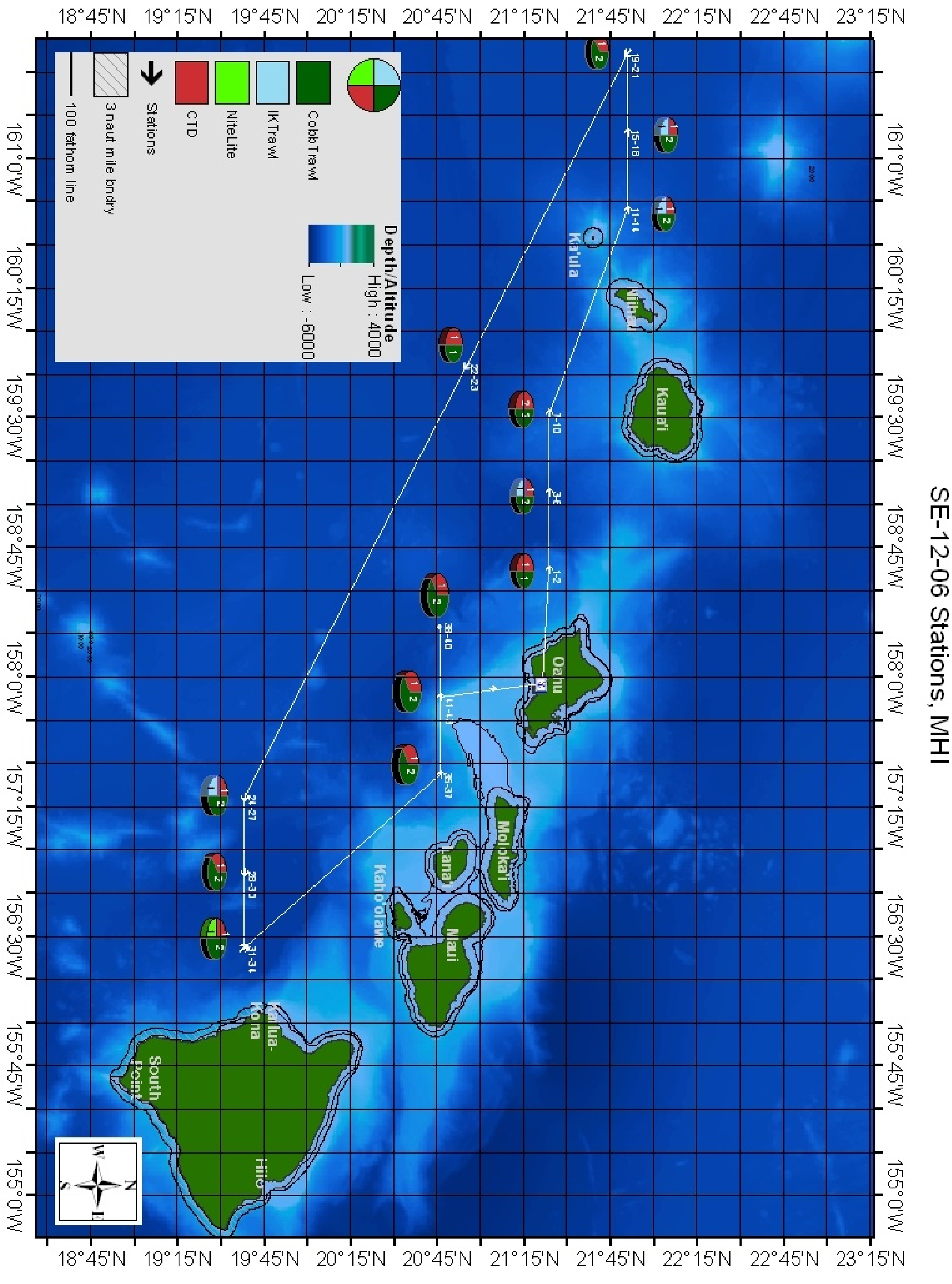

Figure 1.—Cruise operations and station locations for *Oscar Elton Sette* Cruise SE-12-06 along offshore leeward waters of the main Hawaiian Islands (MHI).